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ECONOMICS OF INTENSIVE GRAZING: A Case in Hawaii

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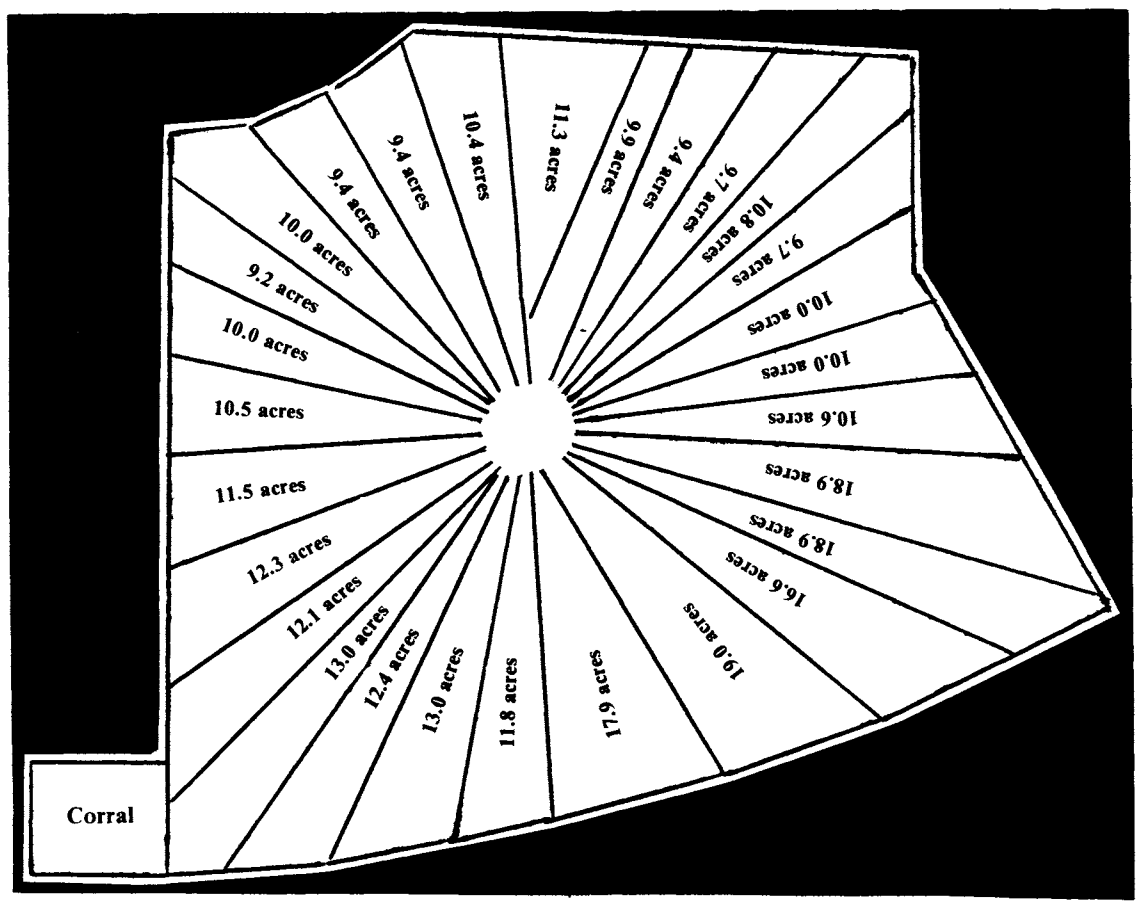

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ECONOMICS OF INTENSIVE GRAZING: A Case in Hawaii

INTRODUCTION

It has been well over a year since the first intensive program (Savory Grazing Method) was adopted in Hawaii. The first grazing cell was placed in operation on the Huehue Ranch in January 1982. By that summer, there were three additional cells in operation. Presently, there are over 30 in the State. Most of the early cells were with breeding herds, and other than noting a sharp increase in stocking rate, very few hard data were available. The one exception to this was the mauka cell at Kahua Ranch, which stocked its first cell with steers. The purpose of this study is to analyze the profitability of changing from the conventional grazing method to intensive grazing of the stocker steer enterprise at this cell. We are very fortunate to have the cooperation and assistance of Mr. H. M. Richards and Mr. Pono von Holt, managers of Kahua Ranch, in providing all the necessary data for the present study.

Partial budgeting was used to evaluate the profitability of the changeover to intensive grazing. As expected, the profit situation of this particular cell has proven to be greatly improved. Instead of producing 250 pounds of beef per acre per year under the conventional method, this operation produced 725 pounds per acre, almost a three fold increase. The initial cost of $36,500 in setting up the cell can be paid back in little more than a year. This investment provides an internal rate of return of 90 percent, assuming the life of the cell is 10 years with no salvage value. An additional profit of $26,000 can be realized from this cell for an average year. There is no question that grazing under the Savory Method is a sound economic venture, as suggested by Savory and Parsons (1980). However, as they have pointed out, the problems generally associated with the development of the Savory Grazing Method are financial and managerial rather than economic. This is due to the large additional cash outlay involved, which requires very careful cash flow planning and budgeting, and also the drastic increase in the number of stock requiring special management attention.

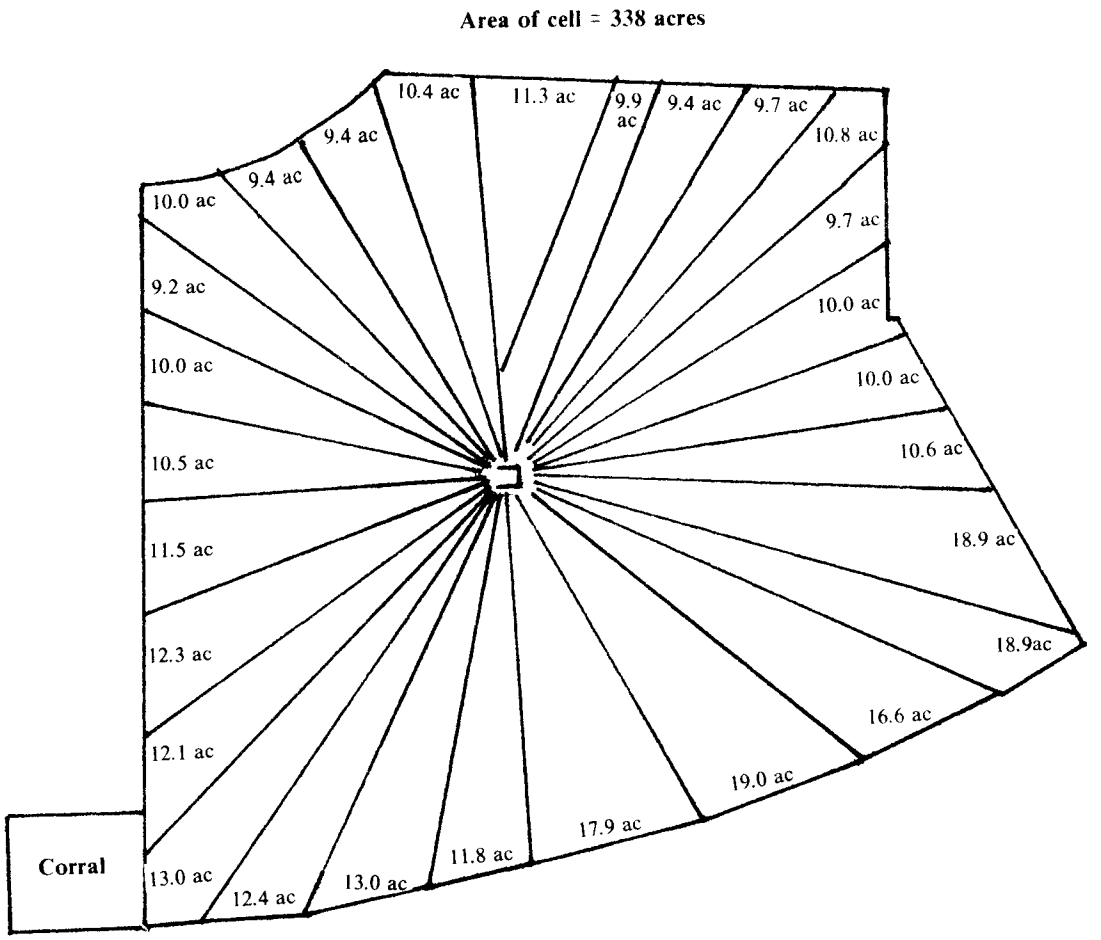
THE SETTING

The grazing cell is on Kahua Ranch, which is located in the Kohala Mountains on the island of Hawaii at an elevation of 3400 feet. This location is characterized by high winds, with average wind speed of more than 20 miles per hour. Average precipitation lies between 35 and 45 inches per year and average temperature is near 70 degrees Fahrenheit. The predominant forage is kikuyu grass (*Pennisitium clandestinium*), which makes up 89.5 percent of the vegetative cover. There are also 2.3 percent of rat tail (*Sporobolus capense*), 3.8 percent of three species of temperate grasses, 2.3 percent of two species of legumes, and the balance in miscellaneous species and rock areas. The soils of this area are relatively fertile and well drained with an average pH of 6.4. The major ecological drawback of this area is the high winds that blow mist from the windward side of the mountain, keeping the area damp much of the year. During the winter months the wind chill has been recorded in the mid- to high thirties. This, coupled with the dampness, creates a considerable energy drain on the animals during a major portion of the year.

The grazing cell consists of 338 acres, divided into 28 paddocks. Paddocks range in size from 9.2 to 19 acres each. All of the paddocks radiate out from a central watering point (see Figure 1). Mineral supplements are also located at the center. The center, or hub, is 336 feet in circumference and is composed of 28 gates, with each gate opening to a paddock. Total elevation change from top to bottom of this cell is about 400 feet. Topography is rolling with two steep gullies transversing the cell. Fencing is electric power fence, powered from an array of solar cells. The fence is composed of three strands of hi-tensile, 12.5-gauge smooth wire. Line posts are made of fiberglass with wooden braced posts at the extreme ends of the radials. The hub is made of iron pipe sunk in concrete.

Two paddocks are always open at any one time. Movement of animals to a fresh paddock is as follows: The cell manager opens the gate to a fresh paddock, then goes to the paddock that has been

Figure 1. Grazing Cell Layout



opened for the longest time period and clears that paddock of animals. He then closes the gate of the just-cleared paddock and leaves. The bulk of the animals, about 99 percent, move themselves to the fresh paddock, usually within a few hours after the gate has been opened. The average rate of rotation, the period of one complete rotation around the cell, is 28 days. However, this rate is not fixed but depends upon the growth rate of the grass and the amount of forage available to the animals. During rapid growth, paddocks may be opened every half day, while during slow growth periods this rate decreases to every one and a half days. The length of stay is at the discretion of the cell manager, guided by plant growth rate. The rate of rotation has varied from 16 days to over 34 days, with animals remaining in any one paddock from half a day to three days.

Prior to the construction of this grazing cell, this area was used as a weaner steer pasture. Historical stocking rate was about one animal (weaner) to the acre. An average year produced about 250 pounds of beef per acre with an average daily gain of 0.68 pounds per animal per day, at one animal per acre. Based upon ranch records, the highest rate of gain in this area was 0.75 pounds per animal per day, but that was only for a two-month period.

Construction of the cell was completed on the 28th of April, 1982, and 625 weaned steers with an average weight of 455 pounds were moved in. Of this number, 30 were individually weighed and marked with identifying ear tags. Subsequently, 177 animals were so weighed and identified. Animals were removed from the cell when they reached 700 pounds in weight and were replaced with new animals as they became available. Forage growing conditions were good from the opening of the cell until the end of 1982. Beginning in January 1983, a severe drought was in effect which persisted until the last weight period on April 21, 1983. Rainfall was considerably below normal with less than 5 inches during this four-month period. However, growth in

the cell remained at a higher level than in adjacent pastures until about the middle of March, when finally the effects of the drought began to be felt. Growth rate slowed down, and the protein content of the forage dropped to around 9 percent. This affected the animal performance significantly.

Based upon these 358 days of operation, the average rate of liveweight gain was 1.12 pounds per animal per day, which translated to about 1.99 pounds per acre per day with an average stocking rate of 1.77 animals per acre. Total production for the 358-day period was 711 pounds per acre. The drought caused a marked reduction in performance during the last weight period of 43 days. Individual performance dropped to 0.60 pounds per day during this period. However, stocking rate had been increased slightly to 1.96 animals per acre. Extrapolating from the last weight period, annual production was estimated to be 725 pounds per acre. This is almost three times the production under the conventional management, which produced about 250 pounds per acre per year. It should be pointed out that this production was accomplished without fertilization and while a drought was in progress for one third of the test period.

The record beef production on tropical pastures on a commercial ranch is 535 pounds per acre per year for a legume/grass combination fertilized with phosphorus, and 1450 pounds with nitrogen fertilization. Higher production values than this have been reported by experimental trials on research stations: 793 pounds per acre per year for legume/grass combination and 2459 pounds from nitrogen-fertilized grass (Dirven, 1977). The production of 725 pounds per acre of the Kahua Ranch's cell after one year of operation, without fertilization, with very little legume in the paddocks, and during four months of drought is not bad, by any standard.

THE ECONOMICS

Partial budgeting was used to analyze the profitability of the changeover from conventional grazing management (CGM) to the Savory Grazing Method (SGM) for a stocker steer operation at the above-mentioned cell. Partial budgeting can be thought of as a type of marginal analysis, as it is best adapted to analyzing small changes in the whole ranch operation (Kay, 1981). Only the changes in costs and income are included in a partial budget and not the total values. The total of the additional costs and reduced income is compared with the total additional income and reduced costs to estimate the gain or loss in profit.

Implementing intensive grazing requires additional cost outlays for more labor, veterinary expenses, mineral supplements, and water associated with a larger herd. There is also an additional investment in constructing the grazing cell. Tables 1 and 2 provide a comparison of the variable expense budget for the SGM and CGM on per-cycle and annual basis respectively. The reason for analyzing the differences on a per-cycle basis is that most of the readily available information is in this format. The per-cycle information was then extended to an annual basis for ease of comparison as shown in Table 2.

Table 1 shows that 597 animals were carried from an average weight of 450 pounds to 700 pounds in 223 days under the SGM, while only 338 animals were carried under the CGM for a longer period of time, 365 days, before achieving the same weight gain per animal. Total revenue calculations were based on an average of 700 pounds per animal at 40 cents a pound. More labor hours were required by the SGM as compared to the CGM, 350 versus 280 man-hours. However, it should be noted that less labor was required on a per-head basis under SGM than under conventional management. The herd under the new system required more daily attention. One hour per day was necessary for checking water, opening gates, maintenance, and miscellaneous chores as compared to only three hours per week under the CGM. Instead of handling the animals four times during the cycle under the CGM, only three times were required for the SGM. Time required for working on each animal was 3.87 minutes each time and was the same under either system. However, corraling under SGM required only 4 man-hours while the CGM required 9 man-hours. This was primarily due to the fact that animals under the new system were more accustomed to the handling by man.

Veterinary cost was $1.00 per animal per handling and each animal required 360 ounces of mineral supplements (which cost $10.16 per 50 pounds) per cycle. Water was charged at 8 cents per 1000 gallons and each animal consumed 10 gallons per day.

The major cost item was the cost of the steer herd and the associated interest charges. It was assumed that the animals were bought at 45 cents a pound with an average weight of 450 pounds per animal. An annual interest charge of 18 percent was assessed on the cost of the herd, as it tied up capital that had

Table 1. Budget per cycle, Savory vs. Conventional. Based on 338 acres

	SAVORY	CONVENTIONAL
Average daily gain, lbs/anim/d	1.12	0.68
Average stocking rate, anim/ac	1.77	1.00
Length of cycle, days	223	365
No. of heads produced	597	338
Total Revenue	167262	94640
Costs :		
Labor hours,		
Check water, open gates, etc	223	156
Cattle handling	116	87
Corraling	12	36
Total hours	350	280
Labor costs @6.00/hr.	2101	1678
Veterinary expenses	1792	1352
Mineral supplements	2736	1548
Water	1063	987
Interest on op. capital @18%	422	501
Steer herd	120966	68445
Interest @18%	13275	12320
TOTAL VARIABLE COSTS	142356	86831
GROSS MARGIN	24906	7809
DIFFERENCE	17097	

*Budget based on variable expenses only

an opportunity cost. Interest was also charged on the average operating capital for labor, veterinary expenses, mineral supplements, and water at an annual rate of 18 percent.

The analysis in Table 1 shows a $17,097 gain in gross margin per cycle under SGM. However, since the length of cycle under the two systems is different, comparison is not as straight forward. The purpose of Table 2 is to convert the per-cycle analysis into an equivalent annual basis for direct comparison. As indicated in Table 2, the SGM produced 642 more animals and contributed $33,041 more to gross margin a year. Since the constructions of the grazing cells costs only $36,459 (see Table 3 for detailed breakdown), the investment is paid back in little more than a year (13 months). The gross margins after the first year will be pure profit. In fact, assuming the life of the cell is 10 years with no salvage value, this investment provides an internal rate of return (or yield on the investment) of 90 percent, which is definitely far above the opportunity cost of the tied capital.

Table 4 provides the change in profit for an average year. It includes the fixed charges (depreciation and interest) of the grazing cell as well as all the variable expenses. It is the typical form of a partial budget. As shown in this table, an additional profit of $26,113 can be realized annually from the

Table 2. Annual Budget, Savory vs. Conventional. Based on 338 acres

ITEM	SAVORY	CONVENTIONAL	DIFFERENCE
Cycle per year	1.64	1.00	0.64
Annual equivalent heads	980	338	642
Total labor hours	574	280	295
Revenue	274338	94640	179698
Costs:			
Labor cost	3446	1678	1768
Veterinary expenses	2939	1352	1587
Mineral supplements	4488	1548	2939
Water	1744	987	757
Interest on op. capital	692	501	191
Steer herd	198405	68445	129960
Interest on herd	21774	12320	9454
Total Costs	233488	86831	146657
GROSS MARGIN	40850	7809	33041

* Based on variable expenses only

Table 3. Cell Construction Cost

ITEM	COST	SUBTOTAL
MATERIALS :		
Electric Fence	13251	
Iron Pins	1475	
Gates	2040	
Pannels	480	
Posts	112	
Concrete	1425	
Miscellaneous	600	
		19383
LABOR:		
2704 hours @ $6.00		16224
EQUIPMENT :		
Truck 338 hours @ $2.00	676	
Welder, Mixer, etc. 176 hours @ $1.00	176	
		852
TOTAL		36459

Table 4. Annual Partial Budget, Savory vs. Conventional

CHANGE : Applying Savory Grazing Method on 338 acres

ADDITIONAL COSTS :		ADDITIONAL REVENUES :	
Fixed Costs :		Steer Sales	179698
Cell Construction			
Depreciation	3646		
Interest	3281		
	6927		
Variable Costs :			
Steer Herd			
Cost	129960		
Interest	9454		
Labor	1768		
Veterinary expenses	1587		
Mineral supplements	2939		
Water	757		
Interest on op. capital	191		
	146657		
TOTAL	153585		179698
ADDITIONAL PROFIT	26113		
ADDITIONAL PROFIT PER ACRE	77		

new operation. This translates to an annual profit of about $77 per acre.

It should be noted that production during this test period can be considered as typical since it is comprised of some good growing months and a drought lasting for four months. Thus, comparison of this production with the average production under the CGM seems reasonable.

CONCLUDING REMARKS

Intensive grazing has been demonstrated to be economically sound in Hawaii, at least for the stocker steer enterprise being analyzed. Data for other enterprises such as cow-calf operation are not available at this time but it is generally believed that the profit situation under the new grazing system for those enterprises will also be greatly improved. Further studies of different enterprises around the state are necessary in order to monitor the economic feasibility of this new grazing management scheme. Based upon the results of this study, SGM appears to offer ranchers in this state a highly viable method to remain economically competitive.

However, since the new method has such a revolutionary effect on the range carrying capacity and the management of the animals, more careful ranch planning and management are necessary for

successful implementation. In particular, the additional cash outlay has to be carefully planned as the borrowing and debt repayment capacities of the ranch may be greatly affected. Increasing the number of stock means more capital will be tied down. For the stocker steer enterprise, whether the animals will be consigned to the feedlot or kept on pasture and sold as grass-fed animals, the ranchers will not be able to cash in the animals until after another long period of time. Therefore, careful cash flow planning is a must for successful changeover to intensive grazing. Another potential problem facing the stocker steer enterprise is the coordination with other enterprises of the ranch in order to have a smooth and timely flow of animals. This requires a high level of operational management skill.

To summarize, intensive grazing appears to be very promising economically, but extra emphasis on ranch planning and management is necessary for successful transition. This can be guided by what Savory and Parsons (1980) termed the "holistic" planning approach, or basically the systems approach. They proposed simultaneous planning of all aspects of the ranch business both in terms of time (short and long term) and subject (livestock, range, finance, marketing, economics, etc.).

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